

Estimating background rates of hospital transfers and deaths in aged care facilities, following COVID-19 vaccination, Australia

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Abstract (50 words)

Residential aged care facilities have been prioritised for early COVID-19 vaccination due to high COVID-19 attack rates and mortality. To facilitate safety surveillance of vaccination implementation in RACF we established seasonally adjusted expected hospitalisation and mortality using de-identified electronic medical record data (from 2015-2019) from a large multijurisdictional Australian dataset.

Letter (499 words)

Introduction

The coronavirus disease 2019 (COVID-19) pandemic disproportionately affected residential aged care facilities (RACF) globally, with high attack rates and case fatality rates of 23% [95%CI 18–28%]¹. Outbreaks have occurred throughout Australia, predominantly in Victoria, with up to 44 residents dying in a single centre². Many RACF residents are frail, with multiple co-morbidities, and would not be represented in vaccine phase 3 safety and efficacy trials due to trial exclusion criteria. Therefore, monitoring the safety of COVID-19 vaccines post program roll-out in this population is paramount, both for vaccine recipients' welfare and to maintain confidence in the vaccine program. Hospitalisations and death proximal to vaccination may cause alarm, however both are more common in the RACF population compared with elderly community members living independently. Recent international experience has underlined the importance of understanding health events following vaccination in RACF³. Estimating the expected background rates of hospital transfer and/or death can inform trend analysis for vaccine safety signals and decrease the risk of coincidental events being blamed upon vaccination⁴.

Methods

We analysed de-identified RACF point-of-care data obtained from *HealthMetrics* (<https://healthmetrics.com.au>), the largest RACF electronic health record (EHR) provider in Australia, for 101 RACFs with over 16,000 resident beds across New South Wales, South Australia, Victoria and Queensland. Hospital transfer and death count data for 2015-2019, covering 706,350 residential bed-months were aggregated by year, month, and RACF postcode. We calculated monthly incidence rates of hospital transfer and death, per 100 beds, with corresponding 95% confidence intervals (95%CI), with assumptions of 100% or 90% bed occupancy, and compared monthly incident risk ratios. We estimated the expected count of hospital transfers and deaths within one week following COVID-19 vaccination, assuming no association with vaccination. Analyses were undertaken in STATA 16.0 (Statacorp, Texas) with Royal Children's Hospital, Victoria ethical approval 37194A.

Results

Aggregated rates (95%CI) of hospital transfer and death in the RACF population in Australia were estimated to be 5.55 (5.48—5.59) and 2.53 (2.49—2.57) per 100 bed-months, respectively. Table 1 summarises background monthly count and rates of studied health outcomes by year per 100 residential beds, assuming 100% or 90% bed occupancy. Seasonal variation was evident with incidence risk ratios of hospital transfer and death higher during mid-winter months of July and August ($p < 0.001$ respectively) (Figure 1 & supplemental appendix). Higher average monthly rates of hospital transfer and death were recorded in 2017, coincident with the severe 2017 Australian influenza season⁵.

The expected rate of hospital transfer and death in one week following COVID-19 vaccination was estimated to be 1.27 (1.10—1.51) and 0.58 (0.44—0.75) per 100 beds/ vaccinated aged-care residents, respectively. For example, for each 10,000 RACF residents receiving COVID-19 vaccination, 127 hospital transfers and 58 deaths would be expected within one week of vaccination, assuming no association with vaccine.

Discussion

These background rates can be used to help evaluate the safety of COVID-19 vaccines administered in RACF setting, increasing confidence to understand not only expected rates of health events, but also to help detect changes above these levels.

References

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Table 1: Count and monthly incidence rate of hospitalisation and death in residential aged care population by year, 2015—2019

Year	Beds	Hospital transfer			Death		
		100% bed occupancy		90% bed occupancy	100% bed occupancy		90% bed occupancy
		count	rate* (95% CI)	rate* (95%CI)	count	rate* (95% CI)	rate* (95%CI)
2015	90083	4301	4.77 (4.63-4.92)	5.30 (5.15-5.47)	2348	2.61 (2.50-2.71)	2.90 (2.78 - 3.02)
2016	119421	6333	5.30 (5.17-5.44)	5.89 (5.75-6.04)	3001	2.51 (2.42-2.60)	2.79 (2.69 - 2.89)
2017	144045	8497	5.89 (5.77-6.03)	6.55 (6.42-6.70)	3973	2.76 (2.67-2.85)	3.06 (2.97 - 3.16)
2018	165354	9169	5.55 (5.43-5.66)	6.16 (6.04-6.29)	4084	2.47 (2.39-2.55)	2.74 (2.66 - 2.83)
2019	187447	10768	5.74 (5.64-5.85)	6.38 (6.26-6.50)	4453	2.38 (2.31-2.45)	2.64 (2.56 - 2.72)
Total	706350	39068	5.55 (5.48-5.59)	6.15 (6.08-6.21)	17859	2.53 (2.49-2.57)	2.81 (2.77 - 2.85)

* Average monthly rate per 100 residential beds (proxy of number of residents)

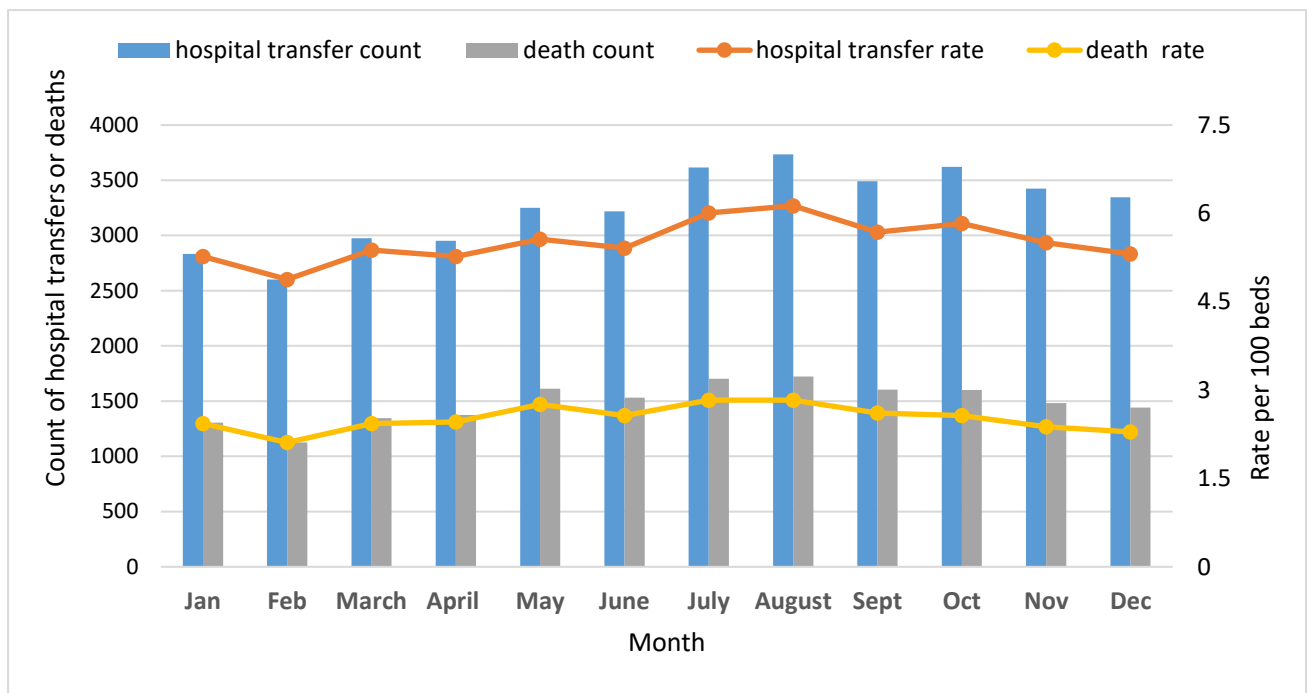


Figure 1: Count and rate of hospital transfer and death in residential aged care population by month, Australia, 2015–2019

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Supplemental Table: Count and rate of hospital transfers and death rates in residential aged care population by month (assuming 100% bed occupancy), Australia, 2015–2019

Month	Beds	Hospital transfer		Death	
		Count	Rate per 100 beds	Count	Rate per 100 beds
January	53720	2832	5.27	1306	2.43
February	53333	2602	4.88	1126	2.11
March	55300	2975	5.38	1346	2.43
April	55999	2951	5.27	1376	2.46
May	58503	3252	5.56	1614	2.76
June	59510	3220	5.41	1531	2.57
July	60156	3615	6.01	1704	2.83
August	60955	3735	6.13	1724	2.83
September	61415	3490	5.68	1605	2.61
October	62185	3623	5.83	1601	2.57
November	62297	3426	5.50	1483	2.38
December	62977	3347	5.31	1443	2.29